



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/719,912	11/21/2003	Tzong Da Ho	55855-DIV (71987)	4010

7590 02/24/2006

EDWARDS & ANGELL, LLP
P.O. Box 9169
Boston, MA 02209

EXAMINER

DUONG, KHANH B

ART UNIT	PAPER NUMBER
----------	--------------

2822

DATE MAILED: 02/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/719,912	Applicant(s) HO ET AL.	
	Examiner Khanh B. Duong	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 7, 2005 has been entered.

Response to Amendment

Accordingly, claim 1 was amended.

Currently, claims 1-4 remain pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Kasem et al. (U.S. Patent No. 6,392,290).

Re claim 1, Kasem et al. ("Kasem") discloses in FIGs. 47A-58C [see col. 9, line 24 to col. 10, line 55] a method for fabricating a thermally-enhanced wafer-level chip scale package, comprising the steps of:

(1) preparing a semiconductor wafer 227 having a front side and a back side, and which is predefined into a plurality of integrated circuit chips 220 [see FIG. 47A-47C];

(2) **then** performing a bumping process to bond a plurality of solder bumps 248 on the front side of the semiconductor wafer 227 [see FIG. 56A-56C];

(3) **then** performing a back-side lapping process to grind away a back-side portion of the semiconductor wafer 227 [see FIG. 54A-54C];

(4) **then** attaching a thermally-conductive stiffener (Cu heat sink) 245 to the back side of the semiconductor wafer 227 by means of a thermally-conductive adhesive layer 246, wherein the thermally-conductive stiffener 245 is free of electrical connection with the semiconductor wafer 227 [see FIG. 55A-55C];

(5) **then** performing a singulation process to cut the thermally-conductive stiffener 245 and cut apart each chip 220 from the semiconductor wafer 227 [see FIG. 58A-58C]; and

(6) **then** performing a flip-chip die bonding process to mount each singulated chip 220 by means of the solder bumps 248 onto a circuited substrate [see FIG. 58A-58C].

Re claim 3, Kasem discloses the thermally-conductive stiffener (heat sink) 245 is made of copper [see col. 10, lines 22-26].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

Art Unit: 2822

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kasem in view of Chen et al. (U.S. Patent No. 6,403,882).

Re claim 2, Kasem discloses the thermally-conductive adhesive 246 comprises solder or epoxy. However, Kasem fails to disclose the epoxy comprising silver epoxy.

Chen et al. ("Chen") suggests attaching a thermally-conductive stiffener 50 comprising of copper to the back side of a semiconductor wafer 20 by a conductive adhesive 45 comprising silver epoxy [see col. 2, lines 45-48; and col. 3, lines 15-25].

Since Kasem and Chen are from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent prior art of Kasem.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kasem as suggested by Chen since Chen states that the conductive adhesive 45 is selected so that it remains stable during

subsequent processing of the chip package at elevated temperatures [see col. 3, lines 6-14, and lines 45-52].

Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kasem in view of Searls et al. (U.S. Patent No. 6,550,531).

Re claim 4, Kasem fails to disclose the thermally-conductive stiffener 245 being made of copper alloy.

Searls et al. ("Searls") teaches in FIG. 5 a thermally-conductive stiffener 208 comprising copper alloy [see col. 1, lines 31-35].

Since Kasem and Searls are from the same field of endeavor, the purpose disclosed by Searls would have been recognized in the pertinent prior art of Kasem.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kasem as suggested by Searls because such conductive material is selected so that it acts as a heat sink which increases the thermal performance of the chip package.

Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

Response to Arguments

Applicant's arguments filed November 7, 2005 have been fully considered but they are not persuasive.

Applicant persistently argues that Kasem fails to teach or suggest a bumping process being performed **prior to** a back-side lapping/grinding process. In response, it is noted that such features are not recited in the rejected claim(s). To further clarify such issue, the new limitation "then" preceding to each of steps 2 to 6 does not necessarily change the scope of those steps to mean that they are being performed in such a sequence. For any one of steps 2 to 6 might just be interpreted as being performed after step 1, or step 1 is performed prior to any one of steps 2 to 6. There is absolutely **no requirement** whatsoever in claim 1 that step 2 (the bumping process) must be performed **prior to** step 3 (the back-side lapping/grinding process).

Applicant further argues that Kasem fails to teach or suggest the step of performing a singulation process to cut a thermally-conductive stiffener and cut apart each chip in **a single step**. In response, it is noted that such features are not recited in the rejected claim(s). To further clarify the issue, step 5 merely recites "performing a singulation process" (emphasis added). Obviously, "a process" does not necessarily equate to "a single step" since a process may comprise a combination of many different steps.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

*** Applicant is hereby suggested to review the following case laws regarding selection of sequence/order of process steps: *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959); *In re*

Art Unit: 2822

Burhans, 154 F. 2d 690, 69 USPQ 330 (CCPA 1946); and *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

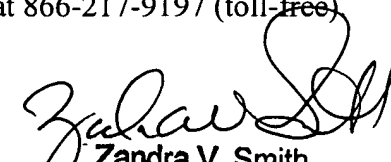
The following U.S. patents disclose performing a bumping process prior to a back-side lapping/grinding process: Senba '127 [see Figs. 4A-4C] and Urushima '195 [see FIGs. 2B and 2C].

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh B. Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith, can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


KBD


Zandra V. Smith
Supervisory Patent Examiner
21 Feb. 2006